MILLIMAN REPORT

Costs of severe obstetric complications in the Texas Medicaid program

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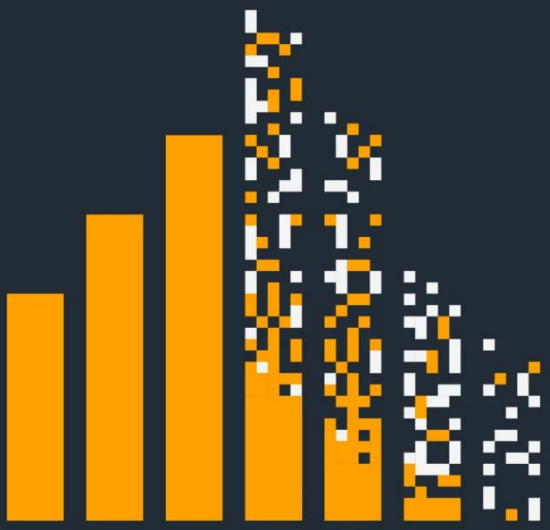

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Executive summary

Maternal morbidity is a critical health challenge in the United States. Severe obstetric complications (SOCs) are a subset of maternal morbidity representing the most clinically serious events occurring at or around delivery and carry significant consequences for mothers, infants, and payers alike. SOCs include events such as blood transfusion, sepsis, eclampsia, and acute respiratory distress syndrome (ARDS) that threaten lives, extend hospitalizations, and drive long-term health consequences for mothers and children.

Milliman was commissioned by the Episcopal Health Foundation and the Michael & Susan Dell Foundation to estimate the prevalence and healthcare costs associated with SOCs among Texas Medicaid STAR beneficiaries, with a specific focus on statewide experience and the North Texas region, defined for this analysis as Dallas and Tarrant counties. Both foundations are providing support to the North Texas Maternal Health Accelerator, a program focused on Dallas and Tarrant counties that is working to prevent SOCs among the Medicaid beneficiaries that they serve. Medicaid bears a disproportionate share of the financial burden of SOCs, covering 41.5% of births nationally and 47.8% of births in Texas as of 2023.[1] By 2025, the share of births covered by Medicaid in Texas had risen to 53%.[2]

For this report, Milliman applied the complication definitions used by partners in the Maternal Health Accelerator, which identify SOCs during the delivery admission and through 60 days post-delivery. The analysis also evaluates severe preeclampsia and hypertensive readmissions, which are not classified as SOCs in all measurement frameworks but are clinically important maternal health events.

KEY FINDINGS

Using Medicaid claims and encounter data from the Transformed Medicaid Statistical Information System (T-MSIS), Milliman identified approximately 132,000 deliveries among Texas Medicaid STAR beneficiaries in 2023, including approximately 22,000 deliveries in North Texas. In this study population, we found that:

- Statewide, 12.6% of deliveries involved at least one studied complication, including 3.6% with at least one SOC.
- In North Texas, these complications were more common: 14.2% of deliveries involved at least one studied complication, including 4.9% with at least one SOC.
- Blood transfusion was the most common SOC identified, occurring in 1.75% of Medicaid STAR deliveries statewide and 2.76% of deliveries in North Texas in 2023.
- Other frequently occurring SOCs included sepsis, ARDS, eclampsia, and pulmonary edema/acute heart failure.
- Severe preeclampsia occurred in 9.5% of deliveries statewide and 10.2% of deliveries in North Texas.

SOCs were associated with worse neonatal outcomes. In a linked mother-newborn sample from Milliman's Consolidated Health Cost Guidelines Sources Database (CHSD), we found that:

- Infants born to mothers with SOCs were less likely to be born full-term and more likely to experience extreme immaturity or respiratory distress syndrome, prematurity, major birth problems, and NICU Level III or IV use.
- Infants born to mothers with more than one SOC were particularly likely to require intensive neonatal care.

SOCs were also associated with substantially higher healthcare costs. We found that:

- Average delivery costs for mothers with any studied complication were approximately 1.6 times higher than for uncomplicated deliveries ($10,237 per delivery vs. $6,387, respectively), and costs for mothers with multiple complications were approximately 2.7 times higher ($17,516 per delivery vs. $6,387, respectively).
- Newborn costs were also higher when mothers experienced SOCs ($11,982 per infant born to mothers with any SOC vs. $5,618 for infants born to mothers with no complications), particularly for complications associated with prematurity and NICU use, such as eclampsia ($25,756 per infant) and ARDS ($50,067 per infant).

Statewide, we estimate that:

- Deliveries involving SOCs resulted in incremental costs of $136.4 million from delivery through the first-year postpartum.

- Most of these incremental costs occurred during the first 60 days post-delivery and were disproportionately driven by higher costs for the additional healthcare use required by infants born to mothers who experienced SOCs.

Overall, these findings suggest that SOCs are frequent and costly contributors to maternal morbidity among Texas Medicaid beneficiaries. Successful efforts to reduce SOCs could improve maternal and infant outcomes while reducing healthcare costs for the Texas Medicaid program. The magnitude of any savings would depend on the specific intervention, the population reached, the reduction in complications achieved, and the cost of implementation.

Introduction

The Episcopal Health Foundation and the Michael & Susan Dell Foundation commissioned Milliman to produce a report describing the prevalence and costs associated with SOCs among Medicaid beneficiaries in Texas, both statewide and in the North Texas region. For this analysis, North Texas is defined as Dallas and Tarrant counties.

This work supports a multi-partner initiative aimed at reducing SOCs and developing payment models that incentivize improvements in maternal health via the Maternal Health Accelerator.[3] This report provides baseline information on the frequency and cost of these events in the Texas Medicaid population and helps inform discussions about the potential health and economic impact of efforts to improve maternal outcomes.

Improving maternal health is a strategic priority in Texas and nationally. The United States has the highest maternal mortality rate among high-income countries, and the Centers for Disease Control and Prevention has estimated that at least 80% of pregnancy-related deaths in the US are preventable.[4,5] Reducing maternal complications can improve health outcomes for mothers and infants, including reducing the risk of death, disability, preterm birth, and avoidable acute care use.[6]

Complications during labor, delivery, and the postpartum period also increase healthcare costs for payers and health systems. Delivery is already one of the most common and costly reasons for hospitalization, and severe complications can substantially increase the cost of the delivery admission, postpartum care, newborn care, and NICU use. As a result, reducing SOC rates has the potential to improve quality and outcomes while lowering costs (both directly and indirectly) for Medicaid and other payers.

SEVERE OBSTETRIC COMPLICATIONS

SOCs are serious clinical events that occur during delivery or in the postpartum period and may result in significant maternal harm. These measures are used by hospitals, payers, public health agencies, and quality measurement organizations to monitor maternal health outcomes. They are related, but not identical, to the broader public health concept of severe maternal morbidity (SMM).[7]

There are many measures used in the healthcare sector related to SOCs, all with slight variations in terms of the conditions included and their technical definitions. For this report, we have used the SOC definitions adopted by partners in the Maternal Health Accelerator, which uses an electronic clinical quality measure (eCQM) developed by The Joint Commission, the Centers for Medicare and Medicaid Services (CMS), and the Yale New Haven Health Service Corporation / Center for Outcomes Research and Evaluation. The Advanced Research Projects Agency for Health (ARPA-H) adapted this eCQM to develop an SOC monitoring methodology for the Maternal Health Accelerator, which differs slightly from other measures of SMM, such as PC-07, used by hospitals, and Pregnancy Associated Outcomes (OAP), a Texas Medicaid measure to evaluate managed care organizations (MCOs). Unlike other eCQMs tracking SMM, the Maternal Health Accelerator's measure includes a 60-day postpartum period, tracks transfusion-only events, does not account for present on admission conditions, and includes mental and behavioral health complications like substance abuse. Under this definition, SOCs are identified from administrative claims data using diagnosis and procedure codes.

The SOCs evaluated in this report include events (e.g., cardiac events, hemorrhage, acute renal failure, sepsis, respiratory distress and pulmonary edema, eclampsia, embolism, severe anesthesia complications and sickle cell crisis), procedures (e.g., blood transfusions, ventilation, tracheotomy, hysterectomy or conversion of cardiac rhythm), and risks related to behavioral health and personal safety (e.g., evidence of abuse at home, substance use disorder, or evidence of a suicide attempt or self-harm) which have been found to be leading causes of maternal death.[8]

In addition to SOCs, this report separately evaluates two additional complications of interest: severe preeclampsia and hypertensive readmissions. These conditions are clinically important because hypertensive disorders of pregnancy are a major contributor to maternal morbidity and can lead to medically indicated preterm delivery, postpartum readmission, and elevated risk for both maternal and neonatal complications.[9]

In 2022, consequences of mental health conditions, including deaths due to suicide and overdose or poisoning related to substance use disorders, were the leading contributors to pregnancy-related deaths in the U.S., accounting

for 27.7% of deaths. This was followed by cardiovascular conditions (16.6%), infections such as COVID-19 (12.2%), and hemorrhage (10.9%).[10]

MANAGEMENT OF RISK FACTORS

The risk for many SOCs may be reduced through appropriate management of risk factors during prenatal care. For example, daily low-dose aspirin is recommended by United States Preventive Services Task Force (USPTF)[11] and the American College of Obstetricians and Gynecologists (ACOG)[12] for women at increased risk for preeclampsia, as clinical evidence suggests that initiating daily low-dose aspirin (81 mg) beginning at 12 weeks gestation can modestly reduce the risk of preeclampsia for this population.[13]

Prenatal iron supplementation reduces maternal anemia by up to 70% based on evidence from over 60 clinical trials.[14,15] Anemia is associated with higher rates of hemorrhage and blood transfusion, which is typically the most frequently occurring SOC.[16,17] A recent study conducted by Parkland Health, a public hospital in Dallas, Texas, found that universal use of iron supplementation beyond what was typically found in prenatal vitamins reduced anemia-related postpartum transfusions by one-third in a predominantly Medicaid population.[18] This Dallas-based study is the basis for the Maternal Health Accelerator's universal prenatal iron distribution program, in which the coalition distributes an over-the-counter prenatal iron supplement through a network of roughly 100 clinics across North Texas.

MATERNAL HEALTH IN TEXAS MEDICAID

In 2025, Medicaid covered 53% of births in Texas.[19] A prior report from Milliman showed that between 2019 and 2021, 31% to 37% of pregnancies in the Texas STAR program (which is the Texas Medicaid program that covers low income children, pregnant women, and families) were classified as high risk, which included the following criteria: 1) maternal age less than 16 or greater than 34 years or 2) diagnoses of preeclampsia, hypertension, diabetes (including gestational), placental complications, or the presence of behavioral health or substance use disorders during pregnancy.[20] This study also found that healthcare costs during pregnancy and through 60 days after delivery were 1.3 times higher for high-risk pregnancies than for non-high-risk pregnancies.

Results

This analysis builds on prior Milliman research examining high-risk pregnancies in the Texas Medicaid population. The present report focuses specifically on the prevalence and costs associated with SOCs among beneficiaries enrolled in the Texas Medicaid STAR program.

Results are presented for Texas statewide and for the North Texas region, defined for the purposes of this report as Dallas and Tarrant counties. Estimates of delivery counts and complication prevalence are based primarily on T-MSIS Medicaid claims and encounter data. Because T-MSIS does not include paid amounts for most Texas Medicaid managed care encounters, cost estimates were developed using a combination of Milliman's CHSD, Texas Medicaid fee schedules, and fee-for-service equivalent (FFSE) repricing methods, as described in the Methodology section.

This analysis is intended to describe the baseline frequency and cost burden of SOCs. It is not intended to estimate the impact of any specific intervention. Where potential savings or extrapolated statewide costs are discussed, those estimates should be interpreted as illustrative of the potential magnitude of costs associated with preventable complications, not as a projection of savings from any particular program. Additionally, this analysis is not meant to suggest that pregnancy-specific conditions alone explain the entirety of the variation observed between cohorts. Other demographic and clinical differences also contribute to differences between cohorts.

This report analyzed a set of 26 SOCs that are the focus of current efforts in Texas by the Maternal Health Accelerator. Complications were identified either by the presence of a qualifying diagnosis code or by the occurrence of a qualifying procedure. Blood transfusions, conversion of cardiac rhythm, hysterectomies, temporary tracheostomies, and the use of ventilation are identified by procedure codes. All other SOCs are identified by diagnosis codes. This includes abuse in the home, acute heart failure/cardiac arrest, acute myocardial infarction, acute renal failure, ARDS, air or thrombotic embolism, amniotic fluid embolism, anesthesia complication, aortic aneurysm, cardiac arrest/ventricular fibrillation, disseminated intravascular coagulation, eclampsia, puerperal cerebrovascular disease, pulmonary edema/acute heart failure, sepsis, shock, sickle cell disease with crisis, substance abuse, and suicide attempt, ideation, or self-harm (noting that some of these, such as abuse in the home, suicide attempt, ideation, or self-harm are likely under-documented in claims data and on typical screening tools). Two other complications of interest not classified as SOCs include hypertensive readmissions following delivery and severe preeclampsia, both of which are also identified by diagnosis codes.

For simplicity, we refer to these complications using the following terminology:

- SOCs: the primary obstetric complications as defined in the Maternal Health Accelerator.
- Additional complications of interest: severe preeclampsia and hypertensive readmissions.
- Any studied complication: any SOC, severe preeclampsia, or hypertensive readmission.

Details on data sources and on the SOC definitions, including lists of qualifying procedures, diagnosis codes, and other criteria are further described in the Methodology section.

PREVALENCE OF SEVERE OBSTETRIC COMPLICATIONS

Statewide, we identified 131,754 deliveries among beneficiaries of the Texas Medicaid STAR program in 2023, with 21,920 of these deliveries occurring in the North Texas region. We found that 12.6% of deliveries statewide and 14.2% of deliveries in North Texas experienced at least one of the complications studied (including SOCs and other complications). We found that 3.6% of deliveries statewide and 4.9% of deliveries in North Texas included at least one SOC. Figure 1 summarizes counts and rates of select delivery events statewide and in North Texas in 2023. Data for 2021 to 2024 are presented for Texas and North Texas alone in Appendices A and B. Note that beneficiaries who experienced more than one SOC per delivery are counted in totals for each specific SOC they experienced but are counted only once in grouped categories.

FIGURE 1: DELIVERY EVENTS FOR TEXAS MEDICAID STAR PROGRAM BENEFICIARIES, 2023, T-MSIS

	Statewide		North Texas	
	Count	Rate (% of deliveries)	Count	Rate (% of deliveries)
All deliveries	**131,754**	**100.00%**	**21,920**	**100.00%**
With no complications	115,091	87.35%	18,800	85.77%
With any SOC or additional complication	16,663	12.65%	3,120	14.23%
With any SOC	4,742	3.60%	1,076	4.91%
Most frequent SOCs				
Blood transfusion	2,309	1.75%	604	2.76%
Sepsis	901	0.68%	168	0.77%
ARDS	492	0.37%	101	0.46%
Eclampsia	328	0.25%	64	0.29%
Pulmonary edema/acute heart failure	316	0.24%	56	0.26%
Other complications				
Severe preeclampsia	12,478	9.47%	2,237	10.21%
Hypertensive readmission	1,163	0.88%	205	0.94%

Blood transfusions were the most common SOC, occurring in 1.75% of deliveries and making up 11.7% of all complications identified statewide in 2023. In North Texas, blood transfusions occurred in 2.76% of deliveries and represented 56.1% of all SOCs in the region. Sepsis, ARDS, eclampsia, and pulmonary edema/acute heart failure were the next most frequently occurring SOCs, both for North Texas and statewide. Severe preeclampsia occurred in 9.5% of deliveries statewide and 10.2% of deliveries in North Texas.

VARIATION BY AGE

When summarized by age, we found that complications were generally more prevalent among women aged 12 to 19 years or 35 years and older compared to women aged 20 to 34 years. The top five most frequently occurring SOCs remained the same across all age groups studied. The percentage of deliveries in Texas from 2021 to 2024 are shown in Figure 2 by age group.

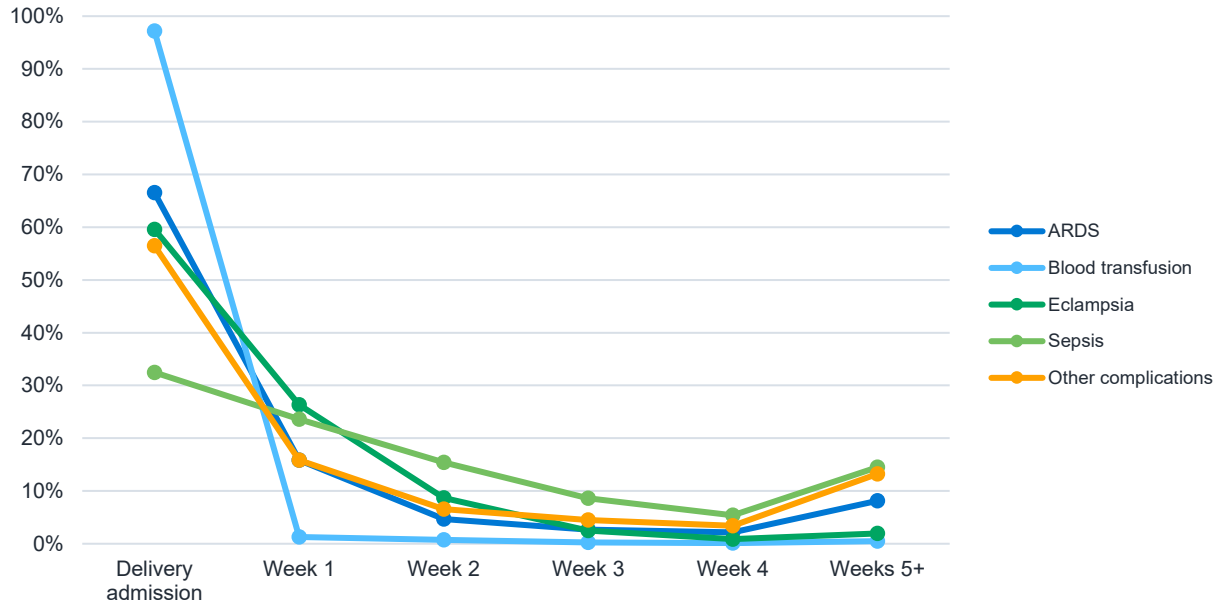
FIGURE 2: EVENTS AS PERCENT OF DELIVERIES BY AGE, STATEWIDE, 2021–2024, T-MSIS

	Age 12-19	Age 20-24	Age 25-29	Age 30-34	Age 35-39	Age 40-55
All deliveries	**32,829**	**123,199**	**122,199**	**77,654**	**32,654**	**8,090**
With no complications	86.13%	88.73%	89.52%	87.54%	83.96%	80.06%
With any SOC or additional complication	13.87%	11.27%	10.48%	12.46%	16.04%	19.94%
With any SOC	4.33%	3.42%	3.11%	3.69%	4.42%	5.54%
Most frequent SOCs						
Blood transfusion	2.38%	1.80%	1.47%	1.62%	1.86%	1.99%
Sepsis	0.86%	0.66%	0.57%	0.59%	0.60%	0.73%
ARDS	0.30%	0.31%	0.37%	0.49%	0.65%	1.09%
Eclampsia	0.44%	0.25%	0.23%	0.29%	0.41%	0.36%
Pulmonary edema/acute heart failure	0.09%	0.14%	0.18%	0.31%	0.53%	0.93%
Other complications						
Severe preeclampsia	10.39%	8.35%	7.66%	9.07%	11.95%	14.81%
Hypertensive readmission	0.38%	0.45%	0.65%	1.16%	1.64%	2.51%

Per the criteria used in the Maternal Health Accelerator, SOCs can be identified anytime from delivery hospital admission through 60 days afterward. We examined the timing of when SOCs first presented within this window and found that the majority of SOCs occurred during delivery admission, with comparatively fewer occurring post-discharge.

Figure 3 shows the proportion of complication events identified during the delivery period and each of the first four weeks following discharge. Note that the apparent increase in rates at weeks 5+ is an artifact of this time period including more than one week.

FIGURE 3: SOC IDENTIFICATION BY TIME, STATEWIDE, 2021-2024, T-MSIS



The majority of SOCs are connected to the delivery period, regardless of the specific SOC. The most common complication, blood transfusions, occurs during delivery 97.2% of the time. Other complications are identified during delivery admission close to 60% of the time. Sepsis is the most likely to be identified after delivery admission, with 67.5% of cases occurring at this time. This suggests that sepsis rates may be understated by SOC measure definitions that do not include a postpartum period compared to the rates reported in this analysis.

NEONATAL OUTCOMES

SOCs are a significant threat to the health of both mothers and newborns. To evaluate how neonatal outcomes vary between infants of mothers who did or did not experience SOCs, we developed a sample of over 9,000 matched mother–infant dyads covered statewide by Texas Medicaid Managed Care plans in Milliman's CHSD.

Details on the matching methodology and sample characteristics can be found in the Methodology section of this report.

Overall, we found that infants born to mothers experiencing SOCs were less likely to be born full-term and were more likely to experience major problems at birth compared to infants born to mothers who did not experience any of the included complications (as indicated by diagnosis-related group codes assigned to the delivery admission). The rate of extreme immaturity (infants born before 28 weeks of gestation) or respiratory distress syndrome was 2.65 times higher for mothers with any SOC and 4.95 times higher for mothers with more than one SOC. This rate was highest among mothers with eclampsia (17.4% of newborns) and ARDS (18.2%). Prematurity (infants born before 37 weeks of gestation) occurred in 8% of births for mothers with any SOC and 11.8% of births for mothers with >1 SOC relative to 5.6% of births without an SOC. Among births to mothers who experienced severe preeclampsia or eclampsia,

12.7% and 21% were premature, respectively. These conditions are of particular interest as they relate to preterm birth because the only effective treatment for the condition is delivery. Induction is often the recommended treatment course when the conditions arise.

Newborns born to mothers with complications have a higher prevalence of major problems as indicated by the diagnosis-related group (DRG) coded for the newborn at the time of delivery. The major problems captured by these codes can include severe respiratory conditions, infections, neurologic injuries or dysfunctions, gastrointestinal diseases, hematologic conditions, metabolic and electrolyte problems, drug-related conditions, or growth and nutritional problems.[21] Among the five most common SOCs identified for mothers in this sample, major problems were the most common for infants of mothers experiencing ARDS and eclampsia. Major problems are often associated with premature birth.

Infants born prematurely or with other complications are typically admitted to the neonatal intensive care unit (NICU) for specialized care. The level of care required at birth is typically categorized as follows[22]:

- Level I – well-newborn nursery: routine care for healthy term/near-term newborns; basic stabilization if problems arise.
- Level II – special care nursery: care for moderately ill newborns or infants born around 32+ weeks or ≥1,500 g who need short-term support, feeding help, oxygen, or recovery after NICU care.
- Level III – NICU: comprehensive intensive care for very preterm, very low birthweight, or critically ill newborns; advanced respiratory support and access to pediatric subspecialists.
- Level IV – regional NICU: highest level; all Level III capabilities plus complex surgery, advanced subspecialty care, and management of the most critically ill newborns.

As shown in Figure 4, infants born to mothers with at least one SOC were nearly two times more likely to require NICU Level III or IV care after birth compared to uncomplicated births. Infants born to mothers with more than one SOC were over five times more likely to require NICU care (levels III or IV) compared to uncomplicated deliveries. Infants born to mothers experiencing eclampsia and ARDS were the most likely to require NICU care (levels III or IV) (6.2 times more likely for both conditions), which may be explained by the high rates of extreme immaturity or respiratory distress syndrome and premature births among this cohort.

FIGURE 4: BIRTH COMPLICATIONS AS INDICATED BY DRG OR REVENUE CODES, BY MATERNAL COMPLICATION, STATEWIDE, 2021–2024, CHSD

	Full-term newborn	Extreme immaturity or respiratory distress	Prematurity	Major problems	Use of NICU (levels III or IV)
No complication	88.9%	2.4%	5.1%	8.0%	7.4%
Any SOC	80.9%	6.4%	8.1%	12.7%	14.5%
Two or more SOCs	68.6%	11.8%	11.8%	19.6%	37.3%
Most frequent SOCs					
Blood transfusion	84.3%	5.6%	6.1%	9.6%	11.2%
Sepsis	86.2%	3.4%	5.2%	8.6%	5.2%
Eclampsia	54.5%	18.2%	22.7%	27.3%	45.5%
Acute renal failure	63.6%	9.1%	13.6%	18.2%	22.7%
ARDS	63.6%	18.2%	4.5%	27.3%	45.5%
Any other SOC	71.6%	8.0%	13.6%	20.5%	29.5%
Other complications					
Severe preeclampsia	74.4%	6.1%	12.9%	14.2%	13.9%
Hypertensive readmission	75.8%	3.2%	10.2%	10.2%	15.1%
Restricted groupings					
Any SOC except transfusion	75.6%	8.7%	9.9%	17.4%	21.5%
Any SOC except transfusion or MH/SUD	75.6%	8.7%	9.9%	17.4%	21.5%
Expanded groupings					
Any SOC or preeclampsia	77.3%	5.7%	11.2%	13.4%	13.4%
Any SOC or preeclampsia or hypertensive readmission	77.6%	5.4%	10.8%	13.2%	13.4%

COSTS OF COMPLICATIONS

Fee-for-service equivalent delivery costs

In Texas, All Patient Refined Diagnosis Related Groups (APR-DRGs) are used to categorize inpatient admissions and to bill for inpatient services. Medicaid reimburses hospitals for inpatient care received by fee-for-service (FFS) beneficiaries based on a fee schedule that defines reimbursement rates for each DRG, severity level, and facility eligible to bill Medicaid.

Although most Medicaid beneficiaries in Texas are enrolled in Managed Care plans, T-MSIS does not include cost details for services received by Managed Care enrollees. To estimate delivery costs for this group, we have repriced inpatient claims for Managed Care enrollees to FFS equivalent (FFSE) based on the fee schedules published by the Texas Medicaid & Healthcare Partnership (TMHP) which administers Texas Medicaid on behalf of the Texas Health and Human Services Commission (Acute Care Hospital Reimbursement).[23] TMHP publishes DRG weights as a factor applied to the universal mean, which it estimates as the overall average cost of an inpatient admission. These factors are calculated for each combination of DRG and severity level. Severity level is determined by logic that incorporates the clinical complexity and resource demand of a case and ranges from level 1 (minor) to 4 (extreme).[24]

Figure 5 shows the estimated average FFSE cost for an inpatient delivery admission by delivery route and complication (as documented by APR-DRG codes). These rates represent a weighted average of FFSE costs assigned to each admit based on APR-DRG, severity level, and facility for deliveries with the listed complications. The actual costs paid by Managed Care plans will differ, but the fee schedules published by TMHP may serve as an anchor point for Medicaid MCOs as they establish their own fee schedules. These estimates are intended to illustrate the likely differences in costs between deliveries with and without the complications studied.

For reference, Figure 6 shows the range of costs associated with each DRG and severity level per the state's FFS program fee schedules. The reimbursement amount for each DRG increases with severity level and is lowest for a vaginal delivery without additional OR services and highest for a cesarean section (C-section) delivery with sterilization. Sterilization via tubal ligation is a common elective procedure added on to C-section deliveries, but sterilization via hysterectomy may also occur due to complications during delivery.

Differences in costs by DRG between complication types are generally driven by differences in the mix of severity levels present for each complication. For example, costs are generally higher for patients experiencing ARDS and sepsis relative to other SOCs due to the high proportion of these deliveries that reach high severity levels, as shown in Figure 7.

FIGURE 5: MATERNITY DELIVERY COSTS BY COMPLICATION AND APR-DRG, STATEWIDE, 2021–2024, T-MSIS

Complication	Vaginal delivery (560)	Vaginal delivery with sterilization (541)	Vaginal delivery without sterilization (542)	C-section with sterilization (539)	C-section without sterilization (540)	Weighted average
Blood transfusion	$4,617	$7,224	$6,612	$8,644	$8,274	**$7,053**
Severe preeclampsia	$4,427	$7,060	$6,882	$8,120	$7,882	**$6,194**
Sepsis	$5,242	$11,612	$12,022	$11,871	$10,576	**$8,058**
ARDS	$5,510	$12,863	$15,232	$15,449	$12,605	**$10,820**
Eclampsia	$4,724	*	*	$8,706	$9,124	**$7,441**
Other complication	$4,402	$6,966	$6,730	$8,008	$7,680	**$6,042**
No complication	$4,112	$6,576	$5,781	$6,937	$6,720	**$5,002**

*Data are censored per CMS policy for cells that are based on 11 or fewer beneficiaries.

FIGURE 6: FFS AVERAGE RATES FOR INPATIENT ADMISSIONS BY APR-DRG AND DRG SEVERITY LEVEL, STATEWIDE, 2021–2024, T-MSIS

DRG description	APR-DRG code	Severity level 1	Severity level 2	Severity level 3	Severity level 4
Vaginal delivery	560	$3,806	$4,336	$5,956	$10,147
Vaginal delivery with sterilization and/or D&C	541	$6,187	$6,940	$7,693	$21,207
Vaginal delivery with O.R. procedure except sterilization and/or D&C	542	$4,741	$5,499	$8,683	$20,660
C-section with sterilization	539	$6,206	$7,484	$11,809	$29,583
C-section without sterilization	540	$5,923	$7,342	$10,032	$19,675

Figure 7 shows the distribution of deliveries by complication and severity level as well as the count of events. The average level is weighted on the severity distribution. This summary excludes deliveries without a valid severity level on the delivery admission.

FIGURE 7: DISTRIBUTION OF MATERNITY APR-DRG SEVERITY LEVELS BY COMPLICATION, STATEWIDE, 2021–2024, T-MSIS

Complication	Event count	Severity level 1	Severity level 2	Severity level 3	Severity level 4	Average level
Blood transfusion	6,766	24.4%	47.0%	24.2%	4.3%	2.1
Severe preeclampsia	37,852	31.0%	47.8%	19.6%	1.6%	1.9
Sepsis	3,559	24.2%	34.2%	21.8%	19.8%	2.4
ARDS	1,956	15.1%	23.7%	23.7%	37.5%	2.8
Eclampsia	1,279	24.7%	36.7%	31.7%	6.8%	2.2
Other complication	40,341	33.3%	47.7%	18.2%	0.8%	1.9
No complication	332,875	57.7%	36.3%	5.9%	0.1%	1.5

Over half of deliveries with no complication are coded with the lowest severity level (57.7%), and more than a third are severity level 2 (36.3%). Deliveries with complications have higher rates of level 3 and level 4 severity compared to the cohort without complications. The share of deliveries at level 3 severity ranges from 18.2% to 24.2% compared to 5.9% for uncomplicated deliveries, and the share at level 4 severity ranges from 0.8% to 37.5% compared to 0.1% for uncomplicated deliveries.

ARDS and sepsis have the highest average severity level at 2.8 and 2.4 respectively. The share of deliveries with ARDS and severity level 4 (major complication) is 37.5%, almost double the next-highest complication (Sepsis, 19.8%). Eclampsia has a higher than typical share of level 4 deliveries (6.8%) and has the highest share of level 3 deliveries (31.7%).

Costs of severe obstetric complications for mother–infant dyads

To illustrate how healthcare costs may be impacted by SOCs beyond the delivery admission itself, we summarized costs for all care received within the first year after delivery for both mothers and newborns using the same sample of over 9,000 linked mother–infant dyads developed from Milliman's research datasets described previously.

To demonstrate how SOCs may impact costs over time beyond the delivery itself, we have summarized costs into three distinct periods: delivery admission, any other care received through 60 days post-delivery, and any other care received within one year (365 days) post-delivery. Prior to the COVID-19 pandemic, Texas Medicaid eligibility rules guaranteed coverage for new mothers through 60 days post-partum (though coverage could continue beyond 60-days if other eligibility criteria were satisfied). Medicaid was prohibited from disenrolling any beneficiaries during the COVID-19 Public Health Emergency (PHE), and thus many new mothers covered by Medicaid remained covered longer than 60 days during this time. After the PHE ended, Texas implemented a new law that extended coverage through 12 months post-partum, effective beginning in March 2024.[25] While costs for those experiencing SOCs are most elevated during the first 60 days post-partum, this analysis demonstrates that many mothers and infants impacted by SOCs continue to require additional healthcare resources beyond 60 days.

Figure 8 summarizes the average costs per delivery incurred for mothers by type of complication. We found that delivery costs for mothers experiencing any of the complications studied were 1.6 times higher than delivery costs incurred for those with uncomplicated deliveries. For mothers who experienced multiple complications, delivery costs were 2.7 times higher than for those with uncomplicated deliveries.

Similarly, neonatal costs for infants were higher for those born to mothers experiencing complications compared to those with uncomplicated deliveries. As shown in Figure 9, delivery costs for infants born to mothers with an SOC were 2.2 to 5 times higher than for those born to mothers who did not experience SOCs.

Costs for deliveries with no complications averaged $6,387 per mother and $5,618 per infant. Among the five most common SOCs, delivery costs were highest for patients experiencing ARDS, with total delivery costs for the mother and infant combined surpassing $66,000. The majority of this cost was for neonatal care rather than for the delivery itself. Deliveries involving a blood transfusion cost $10,344 per delivery for the mother, 1.6 times that of an uncomplicated delivery and $10,391 per infant, 1.8 times that of an uncomplicated birth. Deliveries where the mother had eclampsia had notably higher costs for neonatal care as well. Deliveries where the mother had severe preeclampsia cost 1.1 times more than an uncomplicated birth for the mother and 1.7 times more for the infant.

FIGURE 8: AVERAGE COST PER MOTHER FOR DELIVERY ADMISSION, BY COMPLICATION, 2021–2024, STATEWIDE

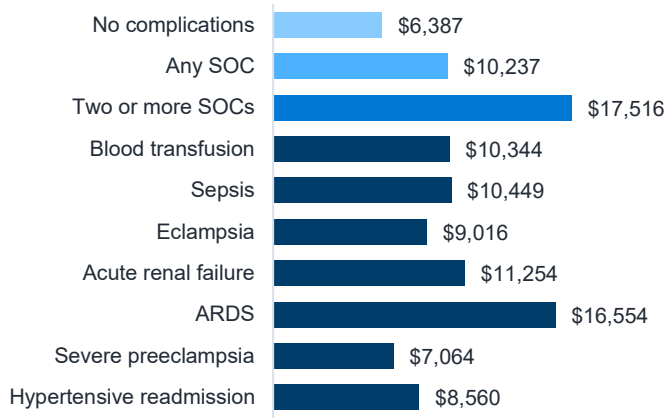


FIGURE 9: AVERAGE COST PER NEWBORN FOR DELIVERY ADMISSION, BY MOTHER'S COMPLICATION, 2021–2024, STATEWIDE

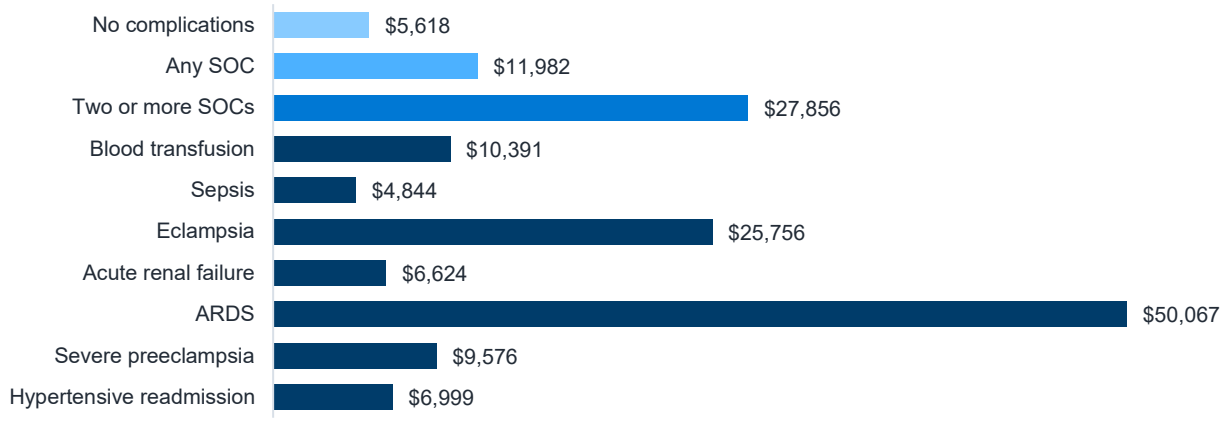


Figure 10 provides a breakdown of the average costs incurred per mother by broad service category after delivery. Costs are shown separately for the first 60 days post-delivery and for days 61 to 365 post-delivery. Figure 11 shows the same summary for newborns. As noted before, Texas Medicaid eligibility was limited to 60 days post-partum before the COVID-19 PHE (unless other eligibility criteria were met), but most of the mothers and infants included in this study retained eligibility for at least a full year post-partum because Medicaid was restricted from disenrolling beneficiaries during the PHE, and Texas passed a law extending Medicaid eligibility through 12 months post-partum beginning in March 2024.

FIGURE 5: AVERAGE HEALTHCARE COSTS PER MOTHER FROM DELIVERY THROUGH 1 YEAR, BY COMPLICATION, 2021–2024, CHSD

Complication	Inpatient	Emergency	Outpatient facility	Outpatient professional	Total
Days 0–60 post-delivery admission					
No complication	**$70**	**$80**	**$165**	**$208**	**$523**
Any SOC	**$727**	**$328**	**$514**	**$286**	**$1,854**
Two or more SOCs	**$1,472**	**$529**	**$785**	**$350**	**$3,137**
Blood transfusion	**$324**	**$118**	**$201**	**$200**	**$844**
Sepsis	$2,203	$817	$1,471	$385	$4,876
Eclampsia	$784	$499	$506	$357	$2,146
Acute renal failure	$1,421	$634	$1,192	$435	$3,683
ARDS	$2,053	$492	$912	$304	$3,760
Severe preeclampsia	$184	$185	$260	$302	$931
Hypertensive readmission	$679	$508	$652	$437	$2,276
Days 61–365 post-delivery admission					
No complication	**$295**	**$249**	**$484**	**$391**	**$1,419**
Any SOC	**$1,673**	**$419**	**$589**	**$498**	**$3,180**
Two or more SOCs	**$8,868**	**$606**	**$1,274**	**$657**	**$11,404**
Blood transfusion	$339	$264	$430	$308	$1,341
Sepsis	$6,728	$473	$951	$650	$8,802
Eclampsia	$669	$181	$308	$428	$1,585
Acute renal failure	$17,237	$1,139	$2,141	$936	$21,453
ARDS	$7,843	$1,085	$2,580	$790	$12,298
Severe preeclampsia	$403	$333	$510	$517	$1,764
Hypertensive readmission	$760	$419	$644	$1,016	$2,839

As expected, costs are higher overall for mothers with complications than without across all major service categories studied. Differences in costs between mothers with and without SOCs are primarily driven by higher inpatient costs, which ranged from 1.2 times higher for mothers experiencing sepsis to 16.9 times higher for mothers experiencing ARDS compared to mothers who did not experience complications.

Similar elevations in costs are present for infants born to mothers experiencing complications in the first 60 days post-delivery, but cost differences are less pronounced afterward. Elevated inpatient costs for the newborn during this period are likely due to more frequent use of NICU care for those born to mothers experiencing complications.

FIGURE 6: AVERAGE HEALTHCARE COSTS PER NEWBORN FROM DELIVERY THROUGH 1 YEAR, BY COMPLICATION, 2021–2024, CHSD

Complication	Inpatient	Emergency	Outpatient facility	Outpatient professional	Total
Days 0–60 post-delivery admission					
No complication	**$1,368**	**$131**	**$129**	**$371**	**$1,999**
Any SOC	**$10,249**	**$135**	**$170**	**$372**	**$10,925**
Two or more SOCs	**$11,208**	**$137**	**$33**	**$374**	**$11,752**
Blood transfusion	$10,498	$97	$90	$361	$11,046
Sepsis	$1,590	$61	$269	$429	$2,349
Eclampsia	$22,123	$283	$682	$412	$23,500
Acute renal failure	$20,995	$219	$19	$384	$21,616
ARDS	$23,122	$282	$37	$282	$23,723
Severe preeclampsia	$2,311	$118	$159	$377	$2,965
Hypertensive readmission	$4,711	$164	$137	$378	$5,390
Days 61–365 post-delivery admission					
No complication	**$2,157**	**$385**	**$442**	**$778**	**$3,763**
Any SOC	**$2,588**	**$461**	**$531**	**$976**	**$4,556**
Two or more SOCs	**$2,649**	**$588**	**$762**	**$984**	**$4,982**
Blood transfusion	$2,774	$528	$668	$995	$4,965
Sepsis	$287	$318	$222	$738	$1,566
Eclampsia	$1,519	$670	$307	$903	$3,398
Acute renal failure	$1,939	$798	$909	$1,250	$4,895
ARDS	$1,221	$737	$1,038	$838	$3,834
Severe preeclampsia	$594	$362	$377	$807	$2,140
Hypertensive readmission	$1,548	$440	$357	$747	$3,092

Statewide extrapolations

To estimate the potential statewide cost burden associated with SOCs, Milliman combined statewide delivery and complication rates from T-MSIS, average cost estimates developed from Milliman's CHSD and Texas Medicaid fee schedules, and public statistics on deliveries covered by Texas Medicaid annually.

According to data from the National Center for Health Statistics, 175,110 deliveries were covered by the Texas Medicaid STAR program in 2024.[26] Based on the prevalence rates identified by Milliman from T-MSIS data, this suggests that 5,924 of these deliveries involved at least one SOC, and 22,393 involved at least one studied complication, including SOCs, severe preeclampsia, or hypertensive readmission, and 152,717 did not involve any of the studied complications.

Average costs were higher for deliveries involving SOCs than for uncomplicated deliveries. Based on the linked mother–newborn dyad analysis, the estimated incremental cost associated with an SOC includes both maternal costs and newborn costs, including the delivery admission, postpartum care, neonatal care, and additional healthcare use through one year post-delivery. Incremental costs per delivery involving an SOC were $3,850 for mothers and $6,363 for infants. The incremental costs for other services in the first 60 days post-delivery were $1,331 per mother and $8,926 per infant. Incremental costs throughout the remainder of the first year post-delivery were $1,760 for mothers and $793 for infants. In total, the incremental costs from delivery through 12 months post-delivery were $6,941 for mothers and $16,083 for infants, with the majority of those cost differences occurring within the first 60 days. While Texas expanded post-partum Medicaid eligibility through 12 months beginning in March 2024, most of the individuals in this study were covered through at least 12 months before this date as well due to restrictions on Medicaid disenrollments during the COVID-19 PHE.

Using these average incremental costs, we estimate that the total annual cost associated with SOCs among Texas Medicaid STAR deliveries was $136.4 million in 2024. When considering other complications, we estimate that the total annual cost associated with any complication studied was $207.0 million. Although SOCs represented approximately 26% of all complications studied, they made up approximately 66% of the costs associated with these complications. Figure 12 summarizes the incremental costs associated with SOCs, both per delivery, and in total statewide.

FIGURE 12: INCREMENTAL HEALTHCARE COSTS ASSOCIATED WITH SOCS, STATEWIDE EXTRAPOLATION, AS OF 2024

Cost category	Healthcare costs with no complications	Healthcare costs with SOCs	Healthcare costs with any complication	Incremental costs of SOCs	Incremental costs of any complication
Average per mother	(a)	(b)	(c)	(d)=(b)-(a)	(e)=(c)-(a)
Delivery admission	$6,387	$10,237	$7,925	$3,850	$1,538
Days 0 to 60	$523	$1,854	$1,284	$1,331	$761
Days 61 to 365	$1,419	$3,180	$2,247	$1,760	$827
Total through 12 months	$8,330	$15,271	$11,456	$6,941	$3,126
Average per infant	(a)	(b)	(c)	(d)=(b)-(a)	(e)=(c)-(a)
Delivery admission	$5,618	$11,982	$9,339	$6,363	$3,721
Days 0 to 60	$1,999	$10,925	$5,216	$8,926	$3,217
Days 61 to 365	$3,763	$4,556	$2,943	$793	-$820
Total through 12 months	$11,380	$27,463	$17,498	$16,083	$6,118
Statewide total	(a)*152,717	(b)*5,924	(c)*22,393	(d)*5,924	(e)*22,393
Mothers – through 12 mo.	$1.27B	$90.5M	$256.5M	$41.1M	$70.0M
Infants – through 12 mo.	$1.74B	$162.7M	$391.8M	$95.3M	$137.0M
Both – through 12 mo.	$3.01B	$253.1M	$648.4M	$136.4M	$207.0M

The Maternal Health Accelerator has a stated goal of reducing SOCs by 20% on average over three years, starting with a 10% reduction in year one, 25% reduction in year two, and a 35% reduction in the final year of its three-year period. Although its efforts are focused on Dallas and Tarrant counties, if a similar goal were to be achieved statewide and if the incremental costs for SOCs were to fall by the same proportions, savings could range from a total of $13.6

million statewide at early implementation to $47.7 million statewide across the entire Texas Medicaid STAR population at full program maturity, for a total of $95.5 million across three years. Figure 13 summarizes these illustrative savings calculations. Actual savings realized would depend on a number of additional factors, but these estimates are intended to illustrate the potential magnitude of savings that may be possible through successful efforts to reduce SOCs.

FIGURE 13: ILLUSTRATIVE ANNUAL SAVINGS ASSOCIATED WITH TARGET REDUCTIONS IN SOCS, STATEWIDE, AT 2024 COST LEVELS

Statewide totals	Incremental healthcare costs of SOCs	Savings at year 1 target	Savings at year 2 target	Savings at year 3 target	Savings over 3 years at targets
SOC reduction target		**10%**	**25%**	**35%**	
Cohort	(a)	(b)=(a)*10%	(c)=(a)*25%	(d)=(a)*35%	(e)=(b)+(c)+(d)
Mothers – through 12 months	$41.1M	$4.1M	$10.3M	$14.4M	$28.8M
Infants – through 12 months	$95.3M	$9.5M	$23.8M	$33.3M	$66.7M
Both – through 12 months	$136.4M	$13.6M	$34.1M	$47.7M	$95.5M

Conclusions

This report provides baseline information on the prevalence and healthcare costs associated with SOCs among Texas Medicaid STAR beneficiaries. In 2023, Milliman identified 131,754 Medicaid STAR deliveries statewide, including 21,920 in North Texas. SOCs occurred in 3.6% of deliveries statewide and 4.9% of deliveries in North Texas. When severe preeclampsia and hypertensive readmissions were also included, 12.6% of statewide deliveries and 14.2% of North Texas deliveries involved at least one studied complication.

Blood transfusion was the most common SOC, followed by sepsis, ARDS, eclampsia, and pulmonary edema/acute heart failure. Severe preeclampsia was also common, occurring in approximately one in ten Medicaid STAR deliveries.

SOCs were associated with worse infant outcomes, including higher rates of prematurity, extreme immaturity or respiratory distress syndrome, major newborn complications, and NICU Level III or IV use. Infants born to mothers with multiple SOCs experienced particularly high rates of NICU use.

Complicated deliveries were also associated with higher healthcare costs for both mothers and newborns. Maternal delivery costs were higher for deliveries involving SOCs, and newborn costs were especially elevated for complications associated with prematurity and NICU use. Post-delivery costs remained higher for mothers with SOCs through at least a full year, particularly when complications resulted in additional inpatient care.

Extrapolated to statewide totals, we estimate that deliveries involving SOCs resulted in an incremental cost of $136.4 million for Texas Medicaid STAR beneficiaries in 2024. Much of this cost occurs within the first 60 days following delivery and is disproportionately driven by additional healthcare utilization needed by infants born to mothers with SOCs.

These findings suggest that interventions capable of reducing SOCs could improve maternal and infant outcomes while also potentially reducing healthcare costs for the Texas Medicaid program. The ultimate financial impact of any intervention would depend on the population reached, the effectiveness of the intervention, the complications prevented, and the costs of implementation. Future research to evaluate the actual performance achieved by the Maternal Health Accelerator and other similar interventions could help better inform expectations, both in terms of the degree of clinical improvements that may be possible and the costs of implementation if similar efforts were adopted statewide.

Methodology

The measures for this report rely on two key data sources.

- CMS Transformed Medicaid Statistical Information System (T-MSIS)
  - T-MSIS contains detailed administrative claims, managed care encounters, and enrollment records for all patients covered by Medicaid and the Children's Health Insurance Program (CHIP).
- Milliman's CHSD
  - Milliman's CHSD contains healthcare experience for Medicaid managed care plans, using data contributed from a number of payers with which Milliman has data purchase or trade agreements. Milliman collects this data from various health plans for use in product development, research, and client projects.

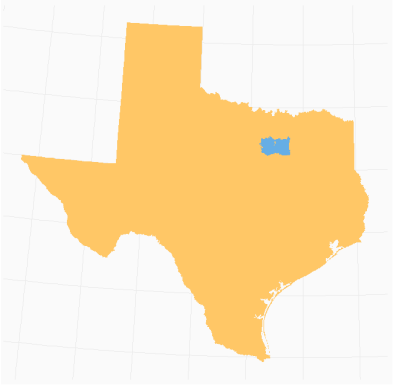
We used claims data for calendar years 2021 to 2024 for this analysis. T-MSIS does not include costs for managed care claims in Texas. As such, we relied on administrative claims from CHSD over the same period to estimate claim costs. We also used CHSD eligibility records to develop a sample of linked mother–infant dyads to support estimates for the impact of health outcomes for mothers on their babies.

POPULATION ANALYZED

We included beneficiaries who are not dual–eligible with Medicare, who are enrolled in the STAR program, and who are female between the ages of 12 and 55 or are newborns of any gender.

A region was assigned to these beneficiaries based on the ZIP code of their home address. North Texas primarily contains Tarrant and Dallas County ZIP codes. Figure 14 shows the North region in blue and the Not-North region in yellow.

FIGURE 74: TEXAS REGIONS ANALYZED



Regional measures were only calculated using T-MSIS data. CHSD does not provide beneficiary home addresses or ZIP codes.

For delivery identification and SOC prevalence analyses, mothers were required to have at least two months of Medicaid enrollment following the delivery admission to support identification of complications occurring through 60 days post-delivery.

For linked mother–infant dyad cost analyses, members with any duration of post-delivery eligibility were retained. Costs reflect claims observed during periods of Medicaid-managed care enrollment and were not annualized for members with incomplete follow-up. As a result, one-year cost estimates reflect Medicaid costs observed through one year post-delivery, inclusive of the effects of coverage lapses, eligibility loss, or transitions to other coverage.

IDENTIFICATION OF DELIVERY INPATIENT ADMISSIONS

Next, we identified deliveries among the analyzed population. First, we identified all inpatient claims with an ICD diagnosis or procedure code or DRG indicating pregnancy. We then excluded admissions that indicated an ectopic pregnancy, abortion, or other terminated pregnancies during the inpatient stay. The identification codes used are listed in Figure 15. Asterisks are wildcards that represent ranges of codes.

FIGURE 85: CODES USED TO IDENTIFY DELIVERY ADMISSIONS

Code Type	Include/Exclude	List of Codes
APR DRG	Include	539*, 540*, 541*, 542*, 560*
ICD diagnosis	Include	Z37*
ICD procedure	Include	10D00Z0, 10D00Z1, 10D00Z2, 10D07Z3, 10D07Z4, 10D07Z5, 10D07Z6, 10D07Z7, 10D07Z8, 10E0XZZ
ICD diagnosis	Exclude	O00*, O01*, O02*, O03*, O04*, O07*, O08*
ICD procedure	Exclude	10A0*

Finally, we counted the number of continuous months of enrollment each mother had following their delivery admission and excluded any mother who did not have at least two months of post-delivery enrollment. In cases where a mother had evidence of two deliveries within a 280-day period, only the first delivery was included for further analysis.

CLASSIFICATION OF SEVERE OBSTETRIC COMPLICATIONS

We relied on documentation provided by the Maternal Health Accelerator for identifying complications to ensure our criteria aligned with those used by its other partners. Per these criteria, SOCs are identified based on all claims during a mother's delivery admission and throughout the following 60 days. The specific diagnosis or procedure code criteria for each complication are presented in Figure 16. Patients experiencing more than one complication were counted once for each complication and were only counted once in grouped categories of complications.

FIGURE 96: CODES USED TO IDENTIFY COMPLICATIONS

Complication	Code type	Code list
Acute myocardial infarction	ICD diagnosis	I2101, I2102, I2109, I2111, I2119, I2121, I2129, I213, I214, I219, I21A1, I21A9, I220, I221, I222, I228, I229
Aortic aneurysm	ICD diagnosis	I790, I7100, I71010, I71011, I71012, I71019, I7102, I7103, I7110, I7111, I7112, I7113, I7120, I7121, I7122, I7123, I7130, I7131, I7132, I7133, I7140, I7141, I7142, I7143, I7150, I7151, I7152, I7160, I7161, I7162, I718, I719
Acute renal failure	ICD diagnosis	O904, N170, N171, N172, N178, N179
ARDS	ICD diagnosis	J80, J951, J952, J953, J95821, J95822, J9600, J9601, J9602, J9620, J9621, J9622, J9690, J9691, J9692, R0603, R092
Amniotic fluid embolism	ICD diagnosis	O88112, O88113, O88119, O8812, O8813
Cardiac arrest/ventricular fibrillation	ICD diagnosis	I462, I468, I469, I4901, I4902
Conversion of cardiac rhythm	ICD procedure	5A12012, 5A2204Z
Disseminated intravascular coagulation	ICD diagnosis	D65, D688, D689, O45002, O45003, O45009, O45012, O45013, O45019, O45022, O45023, O45029, O45092, O45093, O45099, O46002, O46003, O46009, O46012, O46013, O46019, O46022, O46023, O46029, O46092, O46093, O46099, O670
Blood transfusion	ICD procedure	30233H0, 30233K0, 30233L0, 30233M0, 30233N0, 30233P0, 30233R0, 30233T0, 30233H1, 30233K1, 30233L1, 30233M1, 30233N1, 30233P1, 30233R1, 30233T1, 30243H0, 30243K0, 30243L0, 30243M0, 30243N0, 30243P0, 30243R0, 30243T0, 30243H1, 30243K1, 30243L1, 30243M1, 30243N1, 30243P1, 30243R1, 30243T1
Eclampsia	ICD diagnosis	O1500, O1502, O1503, O151, O152, O159

Complication	Code type	Code list
Acute heart failure/cardiac arrest	ICD diagnosis	I97120, I97121, I97130, I97131, I97710, I97711
Puerperal cerebrovascular disease	ICD diagnosis	A812, G450, G451, G452, G453, G454, G458, G459, G460, G461, G462, G463, G464, G465, G466, G467, G468, G9349, H3400, H3401, H3402, H3403, I6000, I6001, I6002, I6010, I6011, I6012, I602, I6030, I6031, I6032, I604, I6050, I6051, I6052, I606, I607, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I6200, I6201, I6202, I6203, I621, I629, I6300, I63011, I63012, I63013, I63019, I6302, I63031, I63032, I63033, I63039, I6309, I6310, I63111, I63112, I63113, I63119, I6312, I63131, I63132, I63133, I63139, I6319, I6320, I63211, I63212, I63213, I63219, I6322, I63231, I63232, I63323, I63239, I6329, I6330, I63311, I63312, I63313, I63319, I63321, I63322, I63233, I63329, I63331, I63332, I63333, I63339, I63341, I63342, I63343, I63349, I6339, I6340, I63411, I63412, I63413, I63419, I63421, I63422, I63423, I63429, I63431, I63432, I63433, I63439, I63441, I63442, I63443, I63449, I6349, I6350, I63511, I63512, I63513, I63519, I63521, I63522, I63523, I63529, I63531, I63532, I63533, I63539, I63541, I63542, I63543, I63549, I6359, I636, I6381, I6389, I639, I6501, I6502, I6503, I6509, I651, I6521, I6522, I6523, I6529, I658, I659, I6601, I6602, I6603, I6609, I6611, I6612, I6613, I6619, I6621, I6622, I6623, I6629, I663, I668, I669, I670, I671, I672, I673, I674, I675, I676, I677, I6781, I6782, I6783, I67841, I67848, I6789, I679, I680, I682, I688, O2250, O2252, O2253, I97810, I97811, I97820, I97821, O873
Pulmonary edema/acute heart failure	ICD diagnosis	I501, I5020, I5021, I5023, I5030, I5031, I5033, I5040, I5041, I5043, I50810, I50811, I50813, I50814, I5082, I5083, I5084, I5089, I509, J810
Anesthesia complication	ICD diagnosis	O29112, O29113, O29119, O29122, O29123, O29129, O29192, O29193, O29199, O29212, O29213, O29219, O29292, O29293, O29299, O740, O741, O742, O743, O8901, O8909, O891, O892, T882XXA, T883XXA
Sepsis	ICD diagnosis	A327, A400, A401, A403, A408, A409, A4101, A4102, A411, A412, A413, A414, A4150, A4151, A4152, A4153, A4159, A4181, A4189, A419, I76, O85, O8604, R6520, R6521, T8112XA, T8144XA
Shock	ICD diagnosis	O751, R570, R571, R578, R579, T782XXA, T8110XA, T8111XA, T8119XA, T886XXA
Sickle cell disease with crisis	ICD diagnosis	D5700, D5701, D5702, D5703, D5709, D57211, D57212, D57213, D57218, D57219, D57411, D57412, D57413, D57418, D57419, D57431, D57432, D57433, D57438, D57439, D57451, D57452, D57453, D57458, D57459, D57811, D57812, D57813, D57818, D57819
Air or thrombotic embolism	ICD diagnosis	I2601, I2602, I2609, I2690, I2692, I2693, I2694, I2699, O88012, O88013, O88019, O8802, O8803, O88212, O88213, O88219, O8822, O8823, O88312, O88313, O88319, O8832, O8833, O88812, O88813, O88819, O8882, O8883, T800XXA
Hysterectomy	ICD procedure	0UT90ZL, 0UT90ZZ, 0UT97ZL, 0UT97ZZ
Temporary tracheostomy	ICD procedure	0B110F4, 0B113F4, 0B114F4
Ventilation	ICD procedure	5A1935Z, 5A1945Z, 5A1955Z
Suicide attempt, ideation, or self-harm	ICD diagnosis during an inpatient admission	R45851, T1491XA, T360X2A, T361X2A, T362X2A, T363X2A, T364X2A, T365X2A, T366X2A, T367X2A, T368X2A, T370X2A, T371X2A, T372X2A, T373X2A, T374X2A, T375X2A, T378X2A, T380X2A, T381X2A, T382X2A, T383X2A, T384X2A, T385X2A, T386X2A, T387X2A, T38802A, T38812A, T38892A, T38902A, T38992A, T39012A, T39092A, T391X2A, T392X2A, T39312A, T39392A, T394X2A, T398X2A, T3992XA, T400X2A, T401X2A, T402X2A, T403X2A, T40412A, T40422A, T40492A, T405X2A, T40602A, T40692A, T40712A, T40722A, T408X2A, T40902A, T40992A, T410X2A, T411X2A, T41202A, T41292A, T413X2A, T415X2A, T420X2A, T421X2A, T422X2A, T423X2A, T424X2A, T425X2A, T426X2A, T428X2A, T43012A, T43022A, T431X2A, T42312A, T43222A, T43292A, T433X2A, T434X2A, T43502A, T43592A, T43602A, T43612A, T43622A, T43623A, T43642A, T43652A, T43692A, T438X2A, T439X2A, T440X2A, T441X2A, T442X2A, T443X2A, T444X2A, T445X2A, T446X2A, T447X2A, T448X2A, T44902A, T44992A, T450X2A, T451X2A, T452X2A, T453X2A, T454X2A, T45512A, T45522A, T45602A, T45612A, T45622A, T45692A, T457X2A, T458X2A, T459X2A, T460X2A, T461X2A, T462X2A, T463X2A, T464X2A, T465X2A, T466X2A, T467X2A, T468X2A, T46902A, T46992A, T470X2A, T471X2A, T472X2A, T473X2A, T474X2A, T475X2A, T476X2A, T477X2A, T478X2A, T480X2A, T481X2A, T48202A, T48292A, T483X2A, T484X2A, T485X2A, T486X2A, T48902A, T48992A, T490X2A, T491X2A, T492X2A, T493X2A, T494X2A, T495X2A, T496X2A, T497X2A, T498X2A, T500X2A, T501X2A, T502X2A, T503X2A, T504X2A, T505X2A, T506X2A, T507X2A, T508X2A, T50A12A, T50A22A, T50A92A, T50B12A, T50B92A, T50Z12A, T50Z92A, T50902A, T50912A, T50992A, X710XXA, X711XXA, X712XXA, X713XXA, X718XXA, X719XXA, X72XXXA, X730XXA, X731XXA, X732XXA, X738XXA, X739XXA, X7401XA, X7402XA, X7409XA, X748XXA, X749XXA, X75XXXA, X76XXXA, X770XXA, X771XXA, X772XXA, X773XXA, X778XXA, X779XXA, X780XXA, X781XXA, X782XXA, X788XXA, X789XXA, X79XXXA, X80XXXA, X810XXA, X811XXA, X818XXA, X820XXA, X821XXA, X822XXA, X828XXA, X830XXA, X831XXA, X832XXA, X838XXA
Abuse in the home	ICD diagnosis during an inpatient admission	T7401XA, T7402XA, T7411XA, T7412XA, T7421XA, T7422XA, T7431XA, T7432XA, T7451XA, T7452XA, T7461XA, T7462XA, T7491XA, T7492XA

Complication	Code type	Code list
Substance abuse	Primary ICD diagnosis during an inpatient admission	F1010, F10120, F10121, F10129, F10130, F10131, F10132, F10139, F1014, F10150, F10151, F10159, F10180, F10181, F10182, F10188, F1019, F1020, F10221, F10229, F10230, F10231, F10232, F10239, F1024, F10250, F10251, F10259, F1026, F1027, F10280, F10281, F10282, F10288, F1029, F1090, F10920, F10921, F10929, F10930, F10931, F10932, F10939, F1094, F10950, F10951, F10959, F1096, F1097, F10980, F10982, F10988, F1099, F1110, F11120, F11122, F11129, F1113, F1114, F11150, F11151, F11159, F11181, F11182, F11188, F1119, F11220, F11221, F11222, F11229, F1123, F1124, F11250, F11251, F11259, F11281, F11282, F11288, F1129, F1190, F11920, F11921, F11922, F11929, F1193, F1194, F11950, F11951, F11959, F11981, F11982, F11988, F1199, F1210, F12120, F12121, F12122, F12129, F1213, F12150, F12151, F12159, F12180, F12188, F1219, F1220, F12220, F12221, F12222, F12229, F1223, F12250, F12251, F12259, F12280, F12288, F1229, F1290, F12920, F12921, F12922, F12929, F1293, F12950, F12951, F12959, F12980, F12988, F1299, F1310, F13120, F13121, F13129, F13130, F13131, F13132, F13139, F1314, F13150, F13151, F13159, F13180, F13181, F13182, F13188, F1319, F1320, F13220, F13221, F13229, F13230, F13231, F13232, F13239, F1324, F13250, F13251, F13259, F1326, F1327, F13280, F13281, F13282, F13288, F1329, F1390, F13920, F13921, F13929, F13930, F13931, F13939, F1394, F13950, F13951, F13959, F1396, F1397, F13980, F13981, F13982, F13988, F1399, F1410, F14120, F14121, F14122, F14129, F1413, F1414, F14150, F14151, F14159, F14180, F14181, F14182, F14188, F1419, F1420, F14220, F14221, F14222, F14229, F1423, F1424, F14250, F14251, F14259, F14280, F14281, F14282, F14288, F1429, F1490, F14920, F14921, F14922, F14929, F1493, F1494, F14950, F14951, F14951, F14959, F14980, F14981, F14982, F14988, F1499, F1510, F15120, F15121, F15122, F15129, F1513, F1514, F15150, F15151, F15159, F15180, F15181, F15182, F15188, F1519, F1520, F15220, F15221, F15222, F15229, F1523, F1524, F15250, F15251, F15259, F15280, F15282, F15282, F15288, F1529, F1590, F15921, F15922, F15929, F1593, F1594, F15950, F15951, F15959, F15980, F15981, F15982, F15988, F1599, F1610, F16120, F16121, F16122, F16129, F1614, F16150, F16151, F15159, F16180, F16183, F16188, F1619, F1620, F16220, F16221, F16229, F1624, F16250, F16251, F16259, F16280, F16283, F16288, F1629, F1690, F16920, F16921, F16929, F1694, F16951, F16959, F16980, F16983, F16988, F1699, F1810, F18120, F18121, F18129, F1814, F18150, F18151, F18159, F1817, F18180, F18188, F1819, F1820, F18220, F18221, F18229, F1824, F18250, F18251, F18259, F1827, F18280, F18288, F1829, F1890, F18920, F18921, F18929, F1894, F18950, F18951, F18959, F1897, F1819188, F1919, F1920, F19220, F19221, F19222, F18980, F18988, F1899, F1910, F19120, F19121, F19122, F19129, F19130, F19131, F19139, F1914, F19150, F19151, F19159, F1916, F1917, F19180, F19181, F19182, F19188, F1920, F19221, F19229, F19230, F19231, F19232, F19239, F1924, F19251, F19259, F1926, F1927, F19280, F19281, F19282, F19288, F1929, F1990, F19920, F19921, F19922, F19929, F19930, F19931, F19932, F19939, F1994, F19950, F19951, F19959, F1996, F1997, F19980, F19981, F19982, F19988, F1999
Substance abuse	Non-primary ICD diagnosis during an inpatient admission	T360X1A, T361X1A, T362X1A, T363X1A, T364X1A, T365X1A, T366X1A, T367X1A, T368X1A, T3691XA, T370X1A, T371X1A, T372X1A, T373X1A, T374X1A, T375X1A, T378X1A, T3791XA, T380X1A, T381X1A, T382X1A, T383X1A, T384X1A, T385X1A, T386X1A, T387X1A, T38801A, T38811A, T38891A, T38901A, T38991A, T39011A, T391X1A, T392X1A, T39311A, T39391A, T394X1A, T398X1A, T3991XA, T400X1A, T401X1A, T402X1A, T403X1A, T40411A, T40421A, T40491A, T405X1A, T40601A, T40691A, T40711A, T40721A, T408X1A, T40901A, T40991A, T410X1A, T411X1A, T41201A, T41291A, T413X1A, T4141XA, T415X1A, T420X1A, T421X1A, T422X1A, T423X1A, T424X1A, T425X1A, T426X1A, T427X1A, T428X1A, T43011A, T43021A, T431X1A, T43201A, T43211A, T43221A, T43291A, T433X1A, T434X1A, T43501A, T43591A, T43601A, T43611A, T43621A, T43631A, T43641A, T43651A, T43691A, T438X1A, T439X1A, T440X1A, T441X1A, T442X1A, T443X1A, T444X1A, T445X1A, T446X1A, T447X1A, T448X1A, T44901A, T44991A, T450X1A, T451X1A, T452X1A, T453X1A, T454X1A, T45511A, T45521A, T45601A, T45621A, T45691A, T457X1A, T458X1A, T4591XA, T460X1A, T461X1A, T462X1A, T463X1A, T464X1A, T465X1A, T466X1A, T467X1A, T468X1A, T46901A, T46991A, T470X1A, T471X1A, T472X1A, T472X1A, T473X1A, T474X1A, T475X1A, T476X1A, T477X1A, T478X1A, T4791XA, T480X1A, T481X1A, T48201A, T48291A, T483X1A, T484X1A, T485X1A, T486X1A, T48901A, T48991A, T490X1A, T491X1A, T492X1A, T493X1A, T494X1A, T495X1A, T496X1A, T497X1A, T498X1A, T4991XA, T500X1A, T501X1A, T502X1A, T503X1A, T504X1A, T505X1A, T506X1A, T507X1A, T508X1A, T50A11A, T50A21A, T50B11A, T50B91A, T50Z11A, T50Z91A, T50901A, T50911A, T50991A
Preeclampsia	ICD diagnosis during an inpatient admission	O111, O112, O113, O114, O115, O119, O1400, O1402, O1403, O1404, O1405, O1410, O1412, O1413, O1414, O1415, O1490, O1492, O1493, O1494, O1495
Hypertensive readmission	ICD diagnosis during a subsequent inpatient admission	O10011, O10012, O10013, O10019, O1002, O1003, O10111, O10112, O10113, O10119, O1012, O1013, O10211, O10212, O10213, O10219, O1022, O1023, O10311, O10312, O10313, O10319, O1032, O1033, O10411, O10412, O10413, O10419, O1042, O1043, O10911, O10912, O10913, O10919, O1092, O1093, O111, O112, O113, O114, O115, O119, O1200, O1201, O1202, O1203, O1204, O1205, O1210, O1211, O1212, O1213, O1214, O1215, O1220, O1221, O1222, O1223, O1224, O1225, O131, O132, O133, O134, O135, O13.9, O1400, O1402, O1403, O1404, O1405, O1410, O1412, O1413, O1414, O1415, O1420, O1422, O1423, O1424, O1425, O1490, O1492, O1493, O1494, O1495, O1500, O1502, O1503, O151, O152, O159, O165, O169, I10

This identification methodology is dependent on the quality and availability of diagnosis and procedure coding. Claims in T-MSIS record up to 7 procedure codes and up to 13 diagnosis codes per claim. CHSD records up to 30 procedure

codes and diagnosis codes per claim. If a qualifying code exists in a position that is not reported in T-MSIS, the estimated prevalence of a complication will be understated.

Some complications may be documented in electronic health records (EHR) which contain data such as physicians' notes. Events documented in EHR but not in claims would not be identifiable in the administrative claim data available to us.

NEWBORN MATCHING

CHSD eligibility and claim records were used to match mothers and infants to examine the association between mother and newborn health and cost outcomes. Mothers and infants were matched in a multi-step process, with matches removed from the pool at the earliest step they were identified as pairs. Matching criteria included the following (in order of priority):

- Mothers and infants with matching contract IDs, matching delivery dates, and residing in the same metropolitan statistical area (MSA)
- Mothers and infants with matching contract IDs and delivery dates
- Mothers and infants with matching contract IDs and delivery dates within 7 days of each other
- Mothers and infants that were the only mother–infant dyad with a shared delivery date in the same MSA
- Mothers and infants that were the only mother–infant dyad with a shared delivery date and the same provider ID
- Mothers and infants that were the only mother–infant dyad with a shared delivery date and the same provider ZIP code

Of the total pool of mothers and infants identified as potentially eligible for inclusion, 28% of infants were able to be linked to a mother, and 21% of mothers were able to be linked to an infant.

CLAIM COSTS

Claims costs for linked mother–infant dyads were developed using CHSD. Costs were grouped into the following broad service categories:

- Delivery admission
- Other inpatient costs
- Emergency department
- Outpatient facility fees
- Outpatient professional services

Costs were summarized over the first 60 days following a delivery admission and through the first year following a delivery admission. Costs were also summarized by complication, route of delivery (C-section vs. vaginal), sterilization, and newborn maturity.

Although T-MSIS does not collect cost information for managed care beneficiaries, it does record DRG codes and severity levels for inpatient claims. These codes were compared to the Texas Medicaid Inpatient fee schedules to estimate the FFSE cost of delivery. Costs for other service categories were not estimated using T-MSIS data.

Caveats and limitations

This report was commissioned by the Episcopal Health Foundation and the Michael & Susan Dell Foundation to describe the prevalence and healthcare costs of SOCs in the Texas Medicaid population. It may not be appropriate for other purposes. This report does not provide recommendations regarding any specific clinical, policy, or payment interventions. Milliman does not intend to benefit or create a legal duty to any other recipient of this work.

Milliman relied on T-MSIS, CHSD, and Texas Medicaid fee schedule information for this analysis. We have not audited the data sets used for this analysis, but have extensive experience using them, and have found them to be reasonable for these purposes. Any errors or omissions in the data sets could affect the results.

Complications were identified using diagnosis and procedure codes in administrative claims and encounter data. Events that were not coded on claims, or that appeared only in medical records, physician notes, or other clinical systems, were not identifiable in this analysis. As a result, the prevalence of some complications may be understated.

T-MSIS does not include paid amounts for most Texas Medicaid managed care claims. Therefore, managed care cost estimates rely on Milliman's CHSD, FFSE repricing methods, and Texas Medicaid fee schedules. Actual amounts paid by Medicaid MCOs may differ from the estimates shown in this report.

The linked mother-newborn dyad analysis was based on a subset of Medicaid managed care experience available in CHSD. The matched dyad sample may differ from the full Texas Medicaid population. As a result, cost and neonatal outcome estimates from the dyad analysis should be interpreted as illustrative of associations between maternal complications and infant outcomes rather than as exact statewide estimates.

Differences between our estimates and actual amounts depend on the extent to which claims records fully capture health outcomes and to which the analysis population reflects the Texas and North Texas populations. Future experience or the experience of any other group will vary from the experience of the populations included in this analysis.

This analysis is observational and descriptive. Differences in costs and outcomes between deliveries with and without complications may reflect the complications themselves as well as underlying differences in maternal risk, comorbidities, gestational age, access to care, and other clinical or demographic factors.

Evaluating or validating any purported savings or improvements in outcomes from external studies was beyond the scope of our engagement. We encourage readers to review our references in full.

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Appendix A – Delivery events, Texas, 2021-2024

Complication	Deliveries with complications				Events per 1,000 deliveries			
	2021	2022	2023	2024	2021	2022	2023	2024
Severe preeclampsia	12,222	13,362	12,478	12,878	88.07	93.80	94.71	97.94
Blood transfusion	2,444	2,537	2,309	2,302	17.61	17.81	17.53	17.51
Hypertensive readmission	1,011	1,092	1,163	1,182	7.29	7.67	8.83	8.99
Sepsis	871	884	901	959	6.28	6.21	6.84	7.29
ARDS	822	583	492	433	5.92	4.09	3.73	3.29
Eclampsia	503	442	328	307	3.62	3.10	2.49	2.33
Pulmonary edema/acute heart failure	384	358	316	328	2.77	2.51	2.40	2.49
Acute renal failure	337	329	344	337	2.43	2.31	2.61	2.56
Puerperal cerebrovascular disease	229	223	225	226	1.65	1.57	1.71	1.72
Air or thrombotic embolism	251	198	216	226	1.81	1.39	1.64	1.72
Disseminated intravascular coagulation	236	224	153	200	1.70	1.57	1.16	1.52
Suicide attempt, ideation, or self-harm	188	157	181	188	1.35	1.10	1.37	1.43
Shock	151	132	160	203	1.09	0.93	1.21	1.54
Ventilation	167	98	99	126	1.20	0.69	0.75	0.96
Substance abuse	94	114	110	115	0.68	0.80	0.83	0.87
Acute myocardial infarction	55	50	56	106	0.40	0.35	0.43	0.81
Cardiac arrest/ventricular fibrillation	43	36	48	78	0.31	0.25	0.36	0.59
Sickle cell disease with crisis	32	40	36	86	0.23	0.28	0.27	0.65
Amniotic fluid embolism	23	37	27	66	0.17	0.26	0.20	0.50
Anesthesia complication	18	26	29	71	0.13	0.18	0.22	0.54
Conversion of cardiac rhythm	16	25	25	73	0.12	0.18	0.19	0.56
Abuse in the home	21	18	25	69	0.15	0.13	0.19	0.52
Hysterectomy	15	16	22	78	0.11	0.11	0.17	0.59
Aortic aneurysm	16	19	25	66	0.12	0.13	0.19	0.50
Acute heart failure/cardiac arrest	15	14	22	67	0.11	0.10	0.17	0.51
Temporary tracheostomy	14	14	19	64	0.10	0.10	0.14	0.49
Any complication	**16,794**	**17,865**	**16,663**	**16,815**	**121.01**	**125.41**	**126.47**	**127.88**
Any complication excluding transfusion	**15,035**	**16,035**	**15,023**	**15,227**	**108.34**	**112.57**	**114.02**	**115.80**
Any complication excluding transfusion and abuse	**15,027**	**16,032**	**15,020**	**15,223**	**108.28**	**112.55**	**114.00**	**115.77**
Any complication excluding preeclampsia, and hypertension	**5,287**	**5,181**	**4,742**	**4,448**	**38.10**	**36.37**	**35.99**	**33.83**
Any complication excluding transfusion, preeclampsia, and hypertension	**3,148**	**2,923**	**2,694**	**2,439**	**22.68**	**20.52**	**20.45**	**18.55**
Any complication excluding transfusion, abuse, preeclampsia, and hypertension	**3,139**	**2,920**	**2,688**	**2,434**	**22.62**	**20.50**	**20.40**	**18.51**

Appendix B – Delivery events, North Texas, 2021-2024

	Deliveries with complications				Events per 1,000 deliveries			
Complication	**2021**	**2022**	**2023**	**2024**	**2021**	**2022**	**2023**	**2024**
Severe preeclampsia	2,140	2,469	2,237	2,384	95.63	103.18	102.05	98.37
Blood transfusion	532	635	604	726	23.77	26.54	27.55	29.96
Hypertensive readmission	161	194	205	186	7.19	8.11	9.35	7.67
Sepsis	154	135	168	164	6.88	5.64	7.66	6.77
ARDS	145	121	101	76	6.48	5.06	4.61	3.14
Eclampsia	81	81	64	64	3.62	3.39	2.92	2.64
Pulmonary edema/acute heart failure	71	62	56	63	3.17	2.59	2.55	2.60
Acute renal failure	59	55	78	57	2.64	2.30	3.56	2.35
Puerperal cerebrovascular disease	40	47	38	49	1.79	1.96	1.73	2.02
Air or thrombotic embolism	48	36	34	38	2.14	1.50	1.55	1.57
Disseminated intravascular coagulation	43	49	25	39	1.92	2.05	1.14	1.61
Suicide attempt, ideation, or self-harm	27	30	25	37	1.21	1.25	1.14	1.53
Shock	27	28	34	38	1.21	1.17	1.55	1.57
Ventilation	35	20	18	18	1.56	0.84	0.82	0.74
Substance abuse	16	27	21	32	0.71	1.13	0.96	1.32
Acute myocardial infarction	14	<11	<11	20	0.63			0.83
Cardiac arrest/ventricular fibrillation	<11	<11	<11	18				0.74
Sickle cell disease with crisis	13	<11	<11	23	0.58			0.95
Amniotic fluid embolism	<11	<11	<11	12				0.50
Anesthesia complication	<11	<11	<11	13				0.54
Conversion of cardiac rhythm	<11	<11	<11	13				0.54
Abuse in the home	<11	<11	<11	14				0.58
Hysterectomy	<11	<11	<11	13				0.54
Aortic aneurysm	<11	<11	<11	13				0.54
Acute heart failure/cardiac arrest	<11	<11	<11	14				0.58
Temporary tracheostomy	<11	<11	<11	12				0.50
Any complication	**2,961**	**3,395**	**3,120**	**3,326**	**132.31**	**141.88**	**142.34**	**137.23**
Any complication excluding transfusion	**2,620**	**2,945**	**2,707**	**2,805**	**117.07**	**123.07**	**123.49**	**115.74**
Any complication excluding transfusion and abuse	**2,618**	**2,943**	**2,707**	**2,805**	**116.98**	**122.99**	**123.49**	**115.74**
Any complication excluding preeclampsia, and hypertension	**1,014**	**1,098**	**1,076**	**1,115**	**45.31**	**45.89**	**49.09**	**46.01**
Any complication excluding transfusion, preeclampsia, and hypertension	**556**	**523**	**531**	**459**	**24.84**	**21.86**	**24.22**	**18.94**
Any complication excluding transfusion, abuse, preeclampsia, and hypertension	**554**	**521**	**530**	**458**	**24.76**	**21.77**	**24.18**	**18.90**

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